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Edwin H. Taylor BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP Seventh Floor 12400 Wilshire Boulevard Los Angeles, CA 90025-1026				
EXAMINER TRAN, BINH X				
ART UNIT 1765		PAPER NUMBER		

DATE MAILED: 12/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/965,972

Applicant(s)

KIM ET AL.

Examiner

Binh X Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 10-22 is/are rejected.
- 7) ☒ Claim(s) 7-9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Election/Restrictions***

1. Applicant's election without traverse of claim 1-22 in Paper filed on 11-06-2003 is acknowledged.

### ***Specification***

2. The disclosure is objected to because of the following informalities:

In page 4 line 18, " $\text{Si}_3\text{N}_4$ " appears to be a typo-error for  $\text{--Si}_3\text{N}_4\text{--}$  (i.e. lower case "i" in regular font, not upper case "I" in subscript font).

In page 5 line 20, " $\text{TiO}_x$ " appears to be a typo error. The character "i" should not be in subscript font. Further, if the applicants wish to use the symbol "x" for the above formula, applicants must define that "x" is integer within a specified range. Otherwise, applicants must use the specific formula such as  $\text{TiO}$  or  $\text{TiO}_2$ .

In page 5 line 22, " $\text{Ta}_a\text{O}_5$ " appears to be a typo error for  $\text{--TaO}_5\text{--}$  (i.e. character "a" should not be in subscript font).

In page 6 line 2, " $\text{Ta}_a$ " and " $\text{Ta}_a\text{N}$ " appears to be a typo error because character "a" should not be in subscript font.

In page 6 line 9, " $\text{Ru}_u$ " and " $\text{Ir}_r$ " appears to be a typo error for " $\text{Ru}$ " and " $\text{Ir}$ " because character "u" and/or "r" should not be in subscript font.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 4-5, 10-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In claim 4 and 11, the examiner does not understand the limitation "the deposition of a conductive electrode layer [i.e. single layer] between the first conductive barrier layer and the dielectric layer and between the dielectric layer and the second conductive layer". The examiner interprets that applicants disclose the step of depositing a single conductive electrode layer at two different locations. The first position locates between the first conductive barrier layer and the dielectric layer. The second position locates between the dielectric layer and the second conductive layer. It is impossible to deposit a single layer at two different locations.

Claim 5 and 11 are rejected under 35 U.S.C. 112, first paragraph, because they depend on claim 4 and/or claim 10.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 3, 5, 9, 11, 14, 18-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 3, 9, 14, "selected from the group consisting of silicon nitride, ..., or barium-strontium-titanate" (emphasis added) is indefinite for improper use of Markush language (See MPEP 2173.05(h)). The examiner suggest replacing "or" with --and--.

In claims 5, 11, "selected from the group of ruthenium or iridium" is indefinite for improper use of Markush language. The examiner suggests replacing "selected from the group of ruthenium or iridium" with --selected from the group consisting of ruthenium and iridium--.

In claim 13, "the conductive barrier layer" (emphasis added) lacks antecedent basis. It is unclear from the claim, whether "the conductive layer" refers to the first barrier layer, or the second barrier layer, or the combination of first and second barrier layer.

7. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: the step of forming a dielectric layer in the vias and trenches. The applicants must disclose the step of forming a dielectric layer before claiming the limitation of "removing a dielectric layer ...from selected vias and trenches".

Claims 19-20 are indefinite because they directly or indirectly depend on claim 18.

***Double Patenting***

8. Applicant is advised that should claim 4 be found allowable, claim 10 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

9. Applicant is advised that should claim 5 be found allowable, claim 11 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. See MPEP § 706.03(k).

10. Applicant is advised that should claim 6 be found allowable, claim 12 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. See MPEP § 706.03(k).

***Claim Rejections - 35 USC § 102***

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

12. The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting

directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

13. Claims 1, 3, 6, 12-14, 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Alers et al. (US 6,320,244).

Alers discloses a method for forming a capacitor in an interlayer dielectric comprising the steps of:

- forming a via (60) and overlying trench in the IDL (Fig 6);

- depositing a first conductive barrier layer (44) so as to line the via and the trench (col. 6 lines 21-23, Fig 6);

- depositing a dielectric layer (46) over the first conductive barrier layer (44);

- depositing a second conductive barrier layer (48) over the dielectric layer;

- filling the via and trench with a conductive material (50) that includes copper over the second conductive barrier layer (48) (col. 6 lines 38-49);

- polishing back the conductive material (50) so as to expose the ILD adjacent to the trench (Fig 7, col. 6 lines 50-59).

Respect to claim 13, Alers teaches the step of lining selective vias and trenches with the first (44) and second (48) barrier layer having a dielectric (46) disposed there between prior to copper layer (50) formation and polishing the copper layer (Fig 6-7).

Respect to claims 3, 14, Alers discloses the dielectric layer is silicon nitride (col. 6 lines 25-27). Respect to claims 6 and 12, Alers discloses that the via (60) exposes an

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underlying conductor (34) (See Fig 6). Respect to 17, Alers discloses that the first barrier layer is in contact with an underlying conductor (34)

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

16. Claims 2, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alers in view of Pramanick et al. (US 6,239,021).

Respect to claims 2 and 15, Alers does not explicitly disclose that the barrier layer comprises tantalum. However, Alers clearly discloses that the barrier layer is tantalum nitride (col. 6 lines 21-22). Pramanick discloses that the barrier layer can be either tantalum or tantalum nitride (col. 3 lines 63-66). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Alers in view of



Pramanick by using tantalum because equivalent and substitution of one for the other would produce an expected result.

17. Claims 4-5, 10-11, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alers in view of Van Buskirk et al. (US 6,346,741).

Respect to claims 4,10 and 16, Alers fails to disclose the step of depositing a electrode layer between the barrier layer and the dielectric layer. Van Buskirk teaches to depositing electrode layers (30 and/or 34) between the barrier layer and the dielectric layer (col. 14 lines 5-25). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Alers in view of Van Buskirk by depositing electrode layers because it would improve the capacitor structure through the forming of stack capacitor.

Respect to claims 5, 11, Van Buskirk discloses the electrode layer comprises iridium (col. 14 lines16-18).

18. Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alers in view of Gambino et al. (US 6,166,423).

Claim 18 differs from Alers by further specifying the step of removing the dielectric layer form the capacitor structure from the selected vias and trenches. Gambino teaches to remove the dielectric layer (322) from the selected vias and trench (See fig 6-7). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Alers in view of Gambino by removing the dielectric layer because it will help to eliminate additional step to pattern the dielectric layer.

Respect to claims 19-20, Alers discloses the step of forming copper layer (50) and polishing the copper layer by removing all material on the ILD between the trenches (See Fig 6-7). The limitation of claim 21 has been discussed above under Alers' reference.

19. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alers and Gambino as applied to claim 21 above, and further in view of Pramanick.

Claim 22 differs from Alers and Gambino by further discloses the step of adding electrode layers between barrier layers and the dielectric layer. Van Buskirk teaches to depositing electrode layers (30 and/or 34) between the barrier layer and the dielectric layer (col. 14 lines 5-25). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Alers in view of Van Buskirk by depositing electrode layers because it would improve the capacitor structure through the forming of stack capacitor.

#### ***Allowable Subject Matter***

20. Claims 7-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. Claim 9 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

#### ***Conclusion***

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22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G Norton can be reached on (703) 305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran



ROBERT KUNEMUND  
PRIMARY EXAMINER